Interaction of Groundwater and Surface Water in the Williston and Powder River Structural Basins

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Groundwater availability in the Lower Tertiary and Upper Cretaceous aquifer systems in the Williston and Powder River structural basins is currently being assessed by the U.S. Geological Survey (USGS). The Williston basin is located in parts of North Dakota, South Dakota, and Montana in the United States and Manitoba and Saskatchewan in Canada. The Powder River basin is located in parts of Montana and Wyoming. Both structural basins are in the forefront of energy development, with an increased demand for both surface water and groundwater uses. As part of this study, the interaction between groundwater and surface water is being quantified. Estimates of base flow, gaining streams, sinking streams, and reservoir interactions have all been computed. Streamflow records from more than 300 streamgages available in the USGS National Water Information System database were used in conjunction with the hydrograph separation software, PART, developed by the USGS. To eliminate interference from natural and anthropogenic processes associated with measuring streamflow, only fall estimates of base flow were used in the study. A net balance approach was used along stream reaches where streamgages were located. Base-flow estimates from PART were compared to actual streamflow measurements. The streamflow estimates were used in the final quantification of the interactions. A water budget for each mainstem reservoir along the Missouri River was completed using data from the U.S. Army Corps of Engineers. Most of the streams in the study area are gaining flow from the aquifers, whereas the main-stem reservoirs are recharging or contributing water to the underlying aquifers.